

USER'S GUIDE

Vaisala DRYCAP® Dewpoint Transmitter DMT152



PUBLISHED BY

Vaisala Oyj
P.O. Box 26
FI-00421 Helsinki
Finland

Phone (int.): +358 9 8949 1
Fax: +358 9 8949 2227

Visit our Internet pages at <http://www.vaisala.com/>

© Vaisala 2010

No part of this manual may be reproduced in any form or by any means, electronic or mechanical (including photocopying), nor may its contents be communicated to a third party without prior written permission of the copyright holder.

The contents are subject to change without prior notice.

Please observe that this manual does not create any legally binding obligations for Vaisala towards the customer or end user. All legally binding commitments and agreements are included exclusively in the applicable supply contract or Conditions of Sale.

Table of Contents

CHAPTER 1

GENERAL INFORMATION	5
About This Manual	5
Contents of This Manual	5
Version Information	6
Related Manuals	6
Documentation Conventions	6
Safety	7
ESD Protection	7
Recycling	7
Regulatory Compliances	8
Trademarks	8
Warranty	8

CHAPTER 2

PRODUCT OVERVIEW	9
Introduction to Dewpoint Transmitter DMT152	9
Basic Features and Options	10
Transmitter Structure	10

CHAPTER 3

FUNCTIONAL DESCRIPTION	13
Advanced DRYCAP® Technology	13
Auto-Calibration	13
Sensor Purge	14

CHAPTER 4

INSTALLATION	15
Selecting the Location	15
Installing the Transmitter	16
Wiring	19
Connection Cables	20
Power Supply Requirements	22
Sampling from a Process	23
Pressure	23
Leak Tightness and Materials	23
Flow	23
Sampling Accessories	24
DMT242SC Sampling Cell	24
DMT242SC2 Sampling Cell with Swagelok Connectors	24
DSC74 Sampling Cell with Quick Connector and	
Leak Screw	25

DSC74B Two Pressure Sampling Cell	26
DSC74C Two-Pressure Sampling Cell with Coil.....	28
NW40 Mounting Flange.....	30

CHAPTER 5

OPERATION.....	31
Serial Communication.....	31
Connecting to the Serial Interface	31
Installing the Driver for the USB Cable	31
Terminal Application Settings.....	32
List of Serial Commands	34
Device Information and Status.....	35
Show Device Information	35
Show Transmitter Status	36
Show Firmware Version	36
Configuring Analog Outputs	37
Limit Alarm.....	38
Purge Status Alarm	39
Malfunction Alarm.....	40
Select Analog Output Quantity and Scaling	40
Configuring Serial Line Operation.....	41
Set Serial Line Settings	41
Set Serial Line Response Time.....	41
Set Transmitter Address.....	42
Format the Measurement Output	42
Select Unit	43
Set Serial Interface Mode.....	44
Configuring Measurement Parameters	44
Enable or Disable Sensor Purge	44
Set Pressure Value for ppm Calculation	45
Set Molar Mass for ppmw Calculation.....	46
Serial Line Output Commands.....	47
Start Measurement Output	47
Stop Measurement Output	47
Set Output Interval.....	47
Output a Reading Once.....	48
Troubleshooting and Maintenance Commands	48
Display the Currently Active Errors	48
Test Analog Outputs.....	48
Calibrate Analog Output	49
Extend Analog Output Range.....	50
Other Commands	50
Opening the Transmitter in POLL Mode	50
Closing the Connection to a Transmitter in POLL Mode.....	50
Display Command List	51
Set Time	51
Reset Transmitter	51
Set LED Voltage	52
Restore Factory Settings.....	52

CHAPTER 6	
MAINTENANCE	53
Cleaning the Transmitter	53
Changing the Filter.....	53
Calibration and Adjustment	55
Field Check Using DM70	55
CHAPTER 7	
TROUBLESHOOTING	59
Typical Problems.....	59
Unknown Serial Settings	60
Error State	60
Error Codes.....	61
Technical Support	62
Product Returns	62
CHAPTER 8	
TECHNICAL DATA	63
Measured Variables.....	63
Operating Environment	64
Outputs.....	64
General	64
Output Cable Specifications	65
Spare Parts and Accessories.....	66
Dimensions in mm (inches)	67

List of Figures

Figure 1	Dewpoint Transmitter DMT152.....	11
Figure 2	DMT152 Installed Directly to Pipeline	16
Figure 3	Removing the Transport Protection Cap	16
Figure 4	Installing the Transmitter	17
Figure 5	Connecting the Cable	17
Figure 6	Connectors I and II	19
Figure 7	Connector Pinout.....	19
Figure 8	Cable with Snap-On Connector.....	20
Figure 9	Cable with Threaded Connector.....	21
Figure 10	LED Cable	21
Figure 11	USB Serial Interface Cable.....	21
Figure 12	Sampling Cells DMT242SC2 (left) and DMT242SC (right)	25
Figure 13	DSC74 Sampling Cell with Accessories	26
Figure 14	DSC74B.....	27
Figure 15	Removing the Leak Screw.....	27
Figure 16	Default Assembly of DSC74C	28
Figure 17	Alternative Assembly of DSC74C (for Tight Spaces)	29
Figure 18	NW40 Mounting Flange.....	30
Figure 19	PuTTY Terminal Application.....	33
Figure 20	Filter Structure	54
Figure 21	Supply Voltage Too Low for mA Output Error	56
Figure 22	Accuracy Over Temperature Range.....	63
Figure 23	DMT152 Dimensions	67

List of Tables

Table 1	Manual Revisions	6
Table 2	Related Manuals.....	6
Table 3	Quantities Measured by the DMT152.....	9
Table 4	DMT152 Default Serial Interface Setting.....	32
Table 5	DMT152 Serial Commands	34
Table 6	FORM Command Quantities	42
Table 7	FORM Command Modifiers.....	43
Table 8	Pressure Conversion Coefficients	45
Table 9	Error Codes	61

CHAPTER 1

GENERAL INFORMATION

This chapter provides general notes for the manual and the Dewpoint Transmitter DMT152.

About This Manual

This manual provides information for installing, operating, and maintaining Dewpoint Transmitter DMT152.

Contents of This Manual

This manual consists of the following chapters:

- Chapter 1, General Information, provides general notes for the manual and the Dewpoint Transmitter DMT152.
- Chapter 2, Product Overview, introduces the features and advantages of Dewpoint Transmitter DMT152.
- Chapter 3, Functional Description, describes the advanced functionality of Dewpoint Transmitter DMT152, including the auto-calibration, sensor purge, and sensor warming functions.
- Chapter 4, Installation, provides you with information that helps you install the Dewpoint Transmitter DMT152.
- Chapter 5, Operation, contains the operating instructions and serial line commands for the Dewpoint Transmitter DMT152.
- Chapter 6, Maintenance, provides information on the maintenance of Dewpoint Transmitter DMT152.
- Chapter 7, Troubleshooting, describes common problems, their probable causes and remedies, and provides contact information for technical support.
- Chapter 8, Technical Data, provides the technical data of Dewpoint Transmitter DMT152.

Version Information

Table 1 **Manual Revisions**

Manual Code	Description
M210865EN-E	May 2010. This version; applicable from software version 1.21 onwards. Updated technical specification, updated serial commands, updated list of spare parts and accessories. Updated description of the auto-calibration feature.
M210865EN-D	October 2008 – Revised instructions for alarm configuration in chapter 5.

Related Manuals

Table 2 **Related Manuals**

Manual Code	Manual Name
M210866EN	Vaisala DRYCAP® Dewpoint Transmitter DMT152 Quick Reference Guide

Documentation Conventions

Throughout the manual, important safety considerations are highlighted as follows:

WARNING	Warning alerts you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.
----------------	---

CAUTION	Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.
----------------	--

NOTE	Note highlights important information on using the product.
-------------	---

Safety

The Dewpoint Transmitter DMT152 delivered to you has been tested for safety and approved as shipped from the factory. Note the following precautions:

CAUTION

Do not modify the unit. Improper modification can damage the product or lead to malfunction.

ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. Vaisala products are adequately protected against ESD for their intended use. It is possible to damage the product, however, by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

- Handle ESD sensitive components on a properly grounded and protected ESD workbench.
- When an ESD workbench is not available, ground yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either of the above precautions, touch a conductive part of the equipment chassis with your other hand before touching ESD sensitive components.
- Always hold component boards by the edges and avoid touching the component contacts.

Recycling



Recycle all applicable material.



Dispose of batteries and the unit according to statutory regulations. Do not dispose of with regular household refuse.

Regulatory Compliances

Vaisala DRYCAP® Dewpoint Transmitter DMT152 is in conformity with the following EU directives, including the latest amendments, and with national legislation implementing these directives:

- RoHS-Directive (2002/96/EEC)
- WEEE Directive (2002/96/EEC)
- EMC-Directive (2004/108/EC)

The conformity is shown by compliance with the following standards:

- EN 61326-1:1997 + A1:1998 + A2:2001 + A3:2003, Electrical equipment for measurement, control and laboratory use - EMC requirements - industrial environment.
- CISPR 22: 2006 Class B, EN 61000-4-2: 2001, EN 61000-4-3: 2002, EN 61000-4-4: 2004, EN 61000-4-5: 2001, EN 61000-4-6: 2003
- EN 50419 (2005-01)

Trademarks

Vaisala DRYCAP® is a registered trademark of Vaisala Oyj.

Windows® is a registered trademark of Microsoft Corporation in the United States and/or other countries.

Warranty

For certain products Vaisala normally gives a limited one-year warranty. Visit our Internet pages for more information and our standard warranty terms and conditions: www.vaisala.com/services/warranty.html.

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

CHAPTER 2

PRODUCT OVERVIEW

This chapter introduces the features and advantages of Dewpoint Transmitter DMT152.

Introduction to Dewpoint Transmitter DMT152

The Vaisala DRYCAP® dewpoint transmitter DMT152 measures dewpoint temperature accurately in a measurement range from -80 °C to -10 °C (-112 ... +14 °F). The maximum output range of the transmitter is -100 ... +20 °C (-148 ... +68 °F).

The DMT152 is designed for a wide range of OEM applications. The transmitter is easy to install, and the mechanics have been designed for harsh environments requiring protection against dust, dirt, and splashed water.

The excellent stability and reliability of the transmitter's performance is based on advanced DRYCAP® polymer sensor technology. The DRYCAP® technology has low maintenance needs due to its excellent long term stability and durability against condensation. For more information on DRYCAP® technology, refer to chapter Functional Description on page 13.

Table 3 Quantities Measured by the DMT152

Quantity	Abbreviation	Metric Unit	Non Metric Unit
Dewpoint/frost point temperature	TDF	°C	°F
Parts per million	H2O	ppm _v / ppm _w	ppm _v / ppm _w

Basic Features and Options

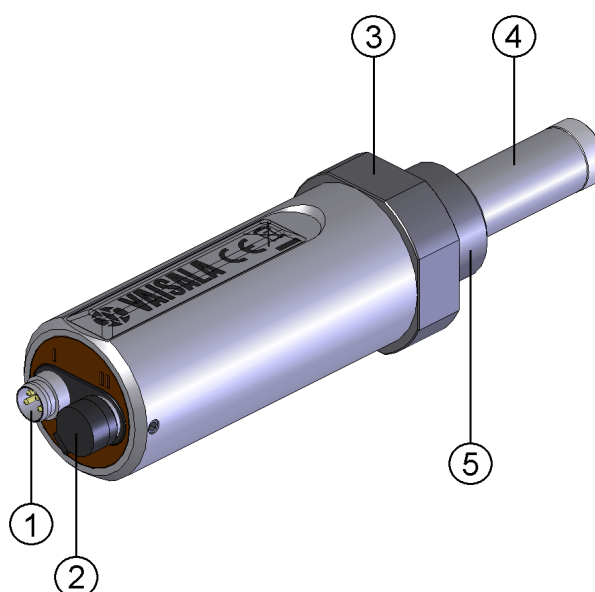
- Calibrated dewpoint measurement range $-80 \dots -10 \text{ }^{\circ}\text{C } T_d$,
output range $-100 \dots +20 \text{ }^{\circ}\text{C } T_d$
- Output in T_d^* and ppm
- DRYCAP® polymer sensor with auto-calibration and sensor purge ensures long term stability
- Small size to fit in tight installations
- Two analog output channels, selectable from $0 \dots 20 \text{ mA} / 4 \dots 20 \text{ mA}$
and $0 \dots 5 \text{ V} / 0 \dots 10 \text{ V}$
- Configurable alarm modes for analog outputs
- Digital output: RS-485
- Serial line connection also via USB serial interface cable
- Simultaneous use of analog and digital output possible
- Field check suitability with DM70 hand-held meter
- Optional sampling cells with different installation options available as DMT152 installation accessories
- LED cable option that enables a visual indication of transmitter status:
LED lit when measurement is frozen (for example, purge active),
blinking for malfunction alarm

* When the dewpoint is below $0 \text{ }^{\circ}\text{C}$, the transmitter outputs frostpoint for T_d

Transmitter Structure

The structure of the DMT152 is shown in Figure 1 on page 11. The transmitter body does not have user serviceable parts inside, and is not designed to be opened. Opening the transmitter will void the warranty.

When the transmitter is delivered, the filter is protected by a yellow transport protection cap that keeps the sensor dry. The transport protection cap should be left on the transmitter during storage. Remove the transport protection cap before installing the transmitter.



0710-151

Figure 1 Dewpoint Transmitter DMT152

where

- 1 = 4-pin M8 connector I: analog output channels and operating power
- 2 = 4-pin M8 connector II (shown with protective cap): digital output (RS-485) and operating power
- 3 = 30mm nut
- 4 = DRYCAP® sensor protected with stainless steel mesh filter (see Figure 20 on page 54)
- 5 = Connection thread: ISO G1/2", UNF 3/4"-16 2A, or NPT 1/2"

When installing a DMT152 transmitter with ISO or UNF thread, use a sealing ring to achieve a tight installation. Three copper sealing rings are provided with the transmitter, and more can be ordered from Vaisala. Note that the sealing rings for ISO and UNF threads are different. See section Spare Parts and Accessories on page 66.

NOTE

Do not use a sealing ring with the NPT thread. Instead, seal the thread using PTFE tape or PTFE paste sealant.

This page intentionally left blank.

CHAPTER 3

FUNCTIONAL DESCRIPTION

This chapter describes the advanced functionality of Dewpoint Transmitter DMT152, including the auto-calibration, sensor purge, and sensor warming functions.

Advanced DRYCAP® Technology

Dewpoint Transmitter DMT152 utilizes an advanced, patented measurement technology to ensure accurate measurement with excellent long term stability. This results in very low maintenance requirements for the transmitter. The lasting performance is achieved with microprocessor technology and software that automatically performs self-diagnostic functions in addition to the normal dewpoint measurement. The self-diagnostic procedures that are conducted are called auto-calibration, sensor purge, and sensor warming.

Auto-Calibration

The auto-calibration feature of the DMT152 transmitter is an automatic procedure which greatly reduces the possible drift in the dry end of the dewpoint measurement. The auto-calibration is performed:

- at 45 minute intervals
- at shorter intervals if T_d is near the dry end of the measurement range
- when the transmitter is powered up
- when the measured environment changes rapidly

During auto-calibration the sensor is warmed for a short period (< 1 min) and the sensor capacitance values are evaluated at the elevated temperature. The possible dry end drift is then corrected to correspond to the calibrated values. Measurement and output remain active during auto-calibration.

Auto-calibration is carried out only if several criteria for the measurement environment are fulfilled. This ensures the reliability of the adjustments, and maintains the excellent long term stability.

Sensor Purge

Sensor purge is also an automatic procedure that minimizes the drift at the wet end readings of the dewpoint measurement. Sensor purge is performed once a week or when the power is switched on. The sensor is heated for several minutes, which will then evaporate all excess molecules out of the sensor polymer. This, together with the auto-calibration, results in a very small drift. The measurement output of the transmitter is frozen to the last measured value for the duration of the sensor purge.

CHAPTER 4

INSTALLATION

This chapter provides you with information that helps you install the Dewpoint Transmitter DMT152.

Selecting the Location

It is important that the conditions at the point of installation represent well the gas to be measured. Temperature changes do not affect the dewpoint measurement, but pressure changes will have an effect on the measurement. All leaks in the system must be eliminated to avoid ambient humidity affecting the measurement.

Direct installation to the measured gas is the recommended installation method if the temperature of the gas is suitable for DMT152 and no additional filtering is needed due to very dusty or oily gas. Oil as such is not harmful for the DRYCAP® sensor, but response time may be slower if there are oil particles in the system, or if oil is collected to the filter over a longer period of time. The maximum measurement pressure is 50 bar_a / 725 psi_a (absolute pressure) for direct measurement.

If the gas temperature is higher than the specified maximum operating temperature of the transmitter, gas sampling and cooling it to ambient temperature (for example, 10 °C / 18 °F) is recommended. Note that the dewpoint temperature must be clearly lower than the ambient temperature to avoid condensation in the sampling line. Sampling from the process is easy by using Vaisala sampling cell options; see section Sampling Accessories on page 24.

The DMT152 is light in weight, which means that it can be installed in a sample pipeline in the sampling cells without the need of any additional mechanical support.

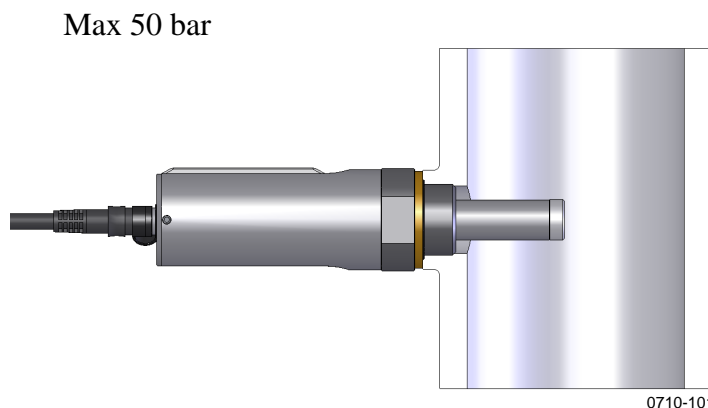


Figure 2 DMT152 Installed Directly to Pipeline

Installing the Transmitter

After selecting a suitable measurement location, follow the procedure below to install the transmitter:

1. Remove the yellow transport protection cap from the transmitter. Do not touch the filter with your hands.

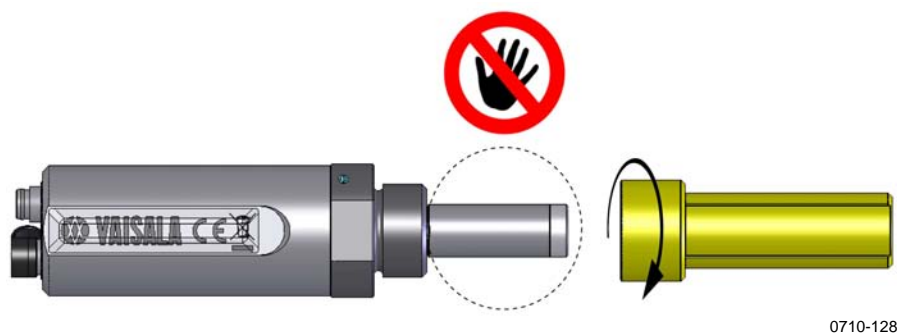
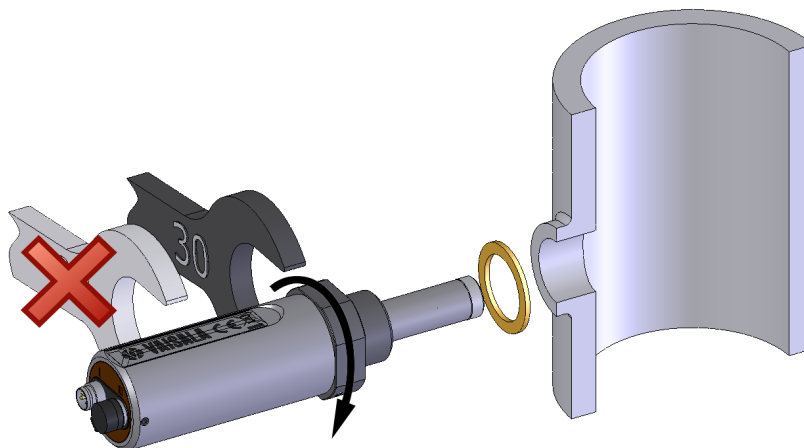


Figure 3 Removing the Transport Protection Cap

2. Prepare the sealing of the connection:
 - If the transmitter has a parallel ISO G1/2" thread or UNF 3/4"-16 thread, place the sealing ring at the base of the thread. Always use a new sealing ring; do not re-use a previously installed one.
 - If the transmitter has an NPT 1/2" thread, do not use the sealing ring. Instead, apply PTFE tape or suitable paste sealant to the thread. Follow the application instructions of the sealant.
3. Make sure that the threads on the mounting point are of the correct type, and fasten the transmitter to the measurement point. Use your hands to turn the probe until it feels tight. Do not use force at this point, and check that the sealing ring (if used) remains centered.



0710-129

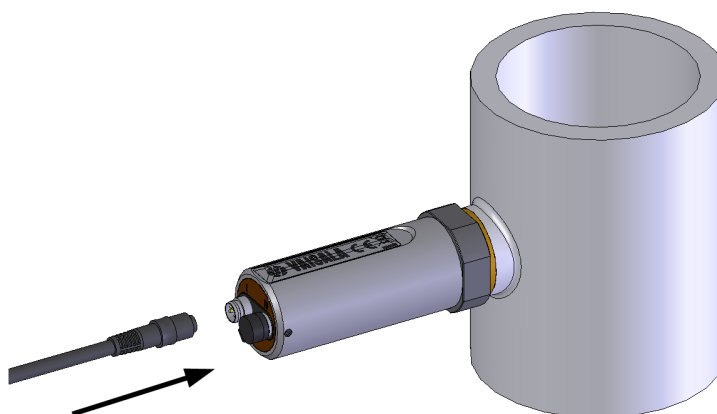
Figure 4 **Installing the Transmitter**

4. Use a 30mm wrench to tighten the connection to 25 N m, as shown in Figure 4. If you do not have a 30mm wrench, use a 1 3/16" wrench or an adjustable wrench.

CAUTION

Only tighten the probe from the 30mm nut. Do NOT apply force to other points in the probe body.

5. Connect the wires of the connection cable. When using cables provided with DMT152 refer to the wiring section on page 19. See the power supply requirements on page 22.



0710-130

Figure 5 **Connecting the Cable**

6. Plug in the cable to the transmitter. Be sure to use the correct connector; refer to section Wiring on page 19.
7. Cover the unused connector on the transmitter with the rubber plug that is attached to the transmitter.

8. Turn on the power supply. The DMT152 performs self diagnostics at startup, and the output is frozen for several minutes. The transmitter will output an approximated reading after one minute, but accurate measurement will only be available after the startup procedure is complete.

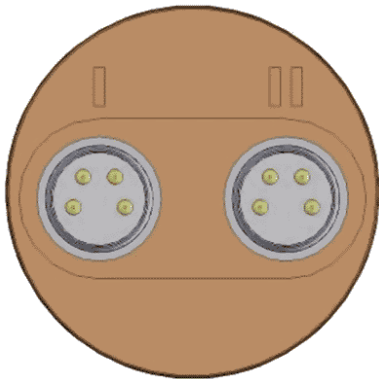
Normal operation is typically achieved in 10 ... 15 minutes. If the measurement environment changes during the startup, the startup may take up to 15 minutes.

NOTE

The transmitter always performs the self-diagnostic procedure and sensor purge when starting up. Keep the transmitter continuously powered to optimize its measurement performance and availability.

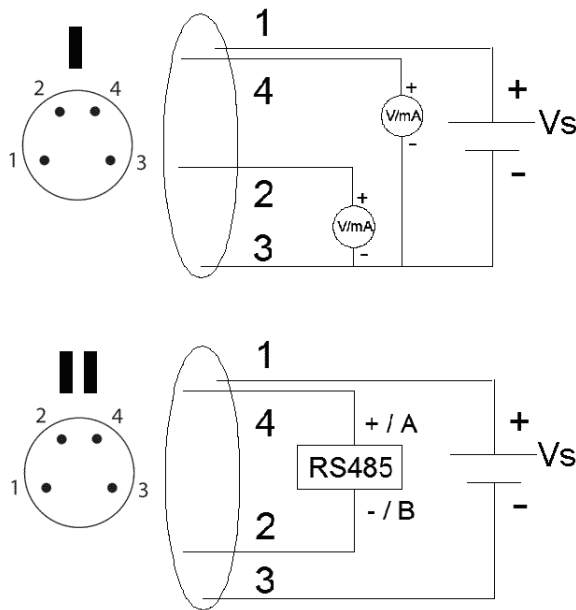
Wiring

Pin	Connector I	Connector II	Wire color
1	VDC supply+	VDC supply+	Brown
2	Signal Ch 1+	RS-485 - / B	White
3	GND	GND	Blue
4	Signal Ch 2+ / LED	RS-485 + / A	Black



0707-035

Figure 6 Connectors I and II



0707-036

Figure 7 Connector Pinout

CAUTION

The power supply lines are internally connected. You can use either one of them, but do not connect more than one supply voltage in permanent installations. Temporary simultaneous use with the USB serial interface cable or DM70 handheld dewpoint meter (which also provide operation power) is OK.

Connection Cables

The following connection cable options are available for DMT152:

- Unshielded cable with M8 female straight snap-on connector
- Shielded cables with M8 female straight threaded connector
- Unshielded cable with LED indicator for analog channel 2, 90° angled M8 female threaded connector
- USB serial interface cable

For the order codes of the cables, refer to section Spare Parts and Accessories on page 66.

NOTE

Avoid using long cables (over 2 m) with voltage output.



0910-134

Figure 8 Cable with Snap-On Connector



0910-135

Figure 9 Cable with Threaded Connector



0809-003

Figure 10 LED Cable



0809-002

Figure 11 USB Serial Interface Cable

Power Supply Requirements

The DMT152 transmitters are designed to operate with a supply voltage of 15 ... 28 VDC (voltage output version) or 21 ... 28 VDC (current output version). When only the RS-485 output is used, 11 ... 28 VDC is enough in typical measurement conditions.

When measuring in pressures 20 ... 50 bar_a (290 ... 725 psi_a) or temperatures -40 ... 0 °C (-40 ... 32 °F), a supply voltage of 21 ... 28 VDC is required.

The power supply should maintain the voltage for all load conditions. The voltage fluctuations must be smaller than 0.3V, as continuous supply voltage fluctuation may interfere with the auto-calibration function.

- If auto-calibration has failed due to the voltage fluctuation, you can verify it using the **STAT** command on the serial line. See section Show Transmitter Status on page 36.
- If auto-calibration fails repeatedly, the **Autocal error** code will be activated. See section Error Codes on page 61.

Current consumption during normal operation is 20 mA. The consumption increases during auto-calibration and sensor purge. The maximum current consumption is 220 mA pulsed current.

NOTE

The DMT152 can be powered by the MI70 indicator or the Vaisala USB cable. However, the power supplied by these devices may not be enough for all functions of the transmitter (for example, the current output).

If you are using a separate power supply in connector I, connect the power supply first before connecting the USB cable or the MI70 indicator. The order is important, since the transmitter will use the power supply that is connected first.

Sampling from a Process

Sampling is needed when direct measurement of the air or gas is not possible or desirable. This may be related to, for example, a high process temperature, protecting the sensor from water spikes, the need to easily detach the instrument from a pressurized process without running the whole process down, or wanting to make the measurement at a more convenient location. To get a representative sample of the process gas and avoid error sources caused by the sampling system, the following aspects should be considered:

Pressure

It is important to keep in mind that changing the pressure of a gas changes the dewpoint temperature of the gas. If the sensor is at a different pressure than the process itself, there may be an error of several tens of degrees in the dewpoint measurement.

You can use the Vaisala Humidity Calculator to simulate the effect of pressure change to dewpoint. The Humidity Calculator can be found at www.vaisala.com/humiditycalculator.

Leak Tightness and Materials

Due to the typically very low level of humidity, dewpoint measurements are sensitive to ambient moisture leaks. It is therefore important to have a leak tight sampling system construction.

The system is likewise sensitive to diffusion of water molecules through the materials, as well as the absorption of moisture into the materials. The piping should preferably be made of metal, for example, stainless steel with a good surface finish. Hygroscopic materials such as plastics are undesirable and should be avoided.

Sample tubing should be as short in length as possible. "Dead ends" should be avoided. Also minimizing the number of connections helps in avoiding leaks. If possible, prepare for measurements by flushing the sampling lines with dry gas.

Flow

Vaisala DRYCAP® sensor is not flow-dependent as such. For this reason, the flow of the system is not critical to the measurement, although a higher flow improves the response time. Typically, a flow of 1 ... 2 l/min (0.035 ... 0.7 ft³/min) is enough.

Sampling Accessories

DMT242SC Sampling Cell

The DMT242SC is a basic sampling cell with only the main sampling cell body. The inlet and outlet are female threaded sample connectors (inlet G3/8", outlet G1/4" ISO). Refer to Figure 12 on page 25.

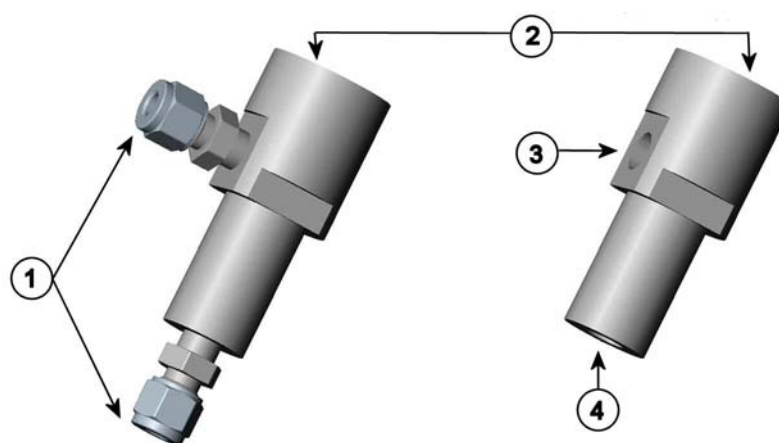
The DMT242SC is suitable for users requiring only a sampling cell to fit the probe into and doing further assembly (piping into inlet & outlet, valves, possible flow meter) by themselves.

DMT242SC2 Sampling Cell with Swagelok Connectors

The DMT242SC2 is similar to DMT242SC, but connections are made easy. The sampling cell includes welded swagelok connectors at both the inlet and outlet that fit directly to 1/4" tubing.

To fit 6 mm tubing to the connectors, an adapter such as Swagelok® Reducer SS-6M0-R-4 (not supplied by Vaisala) can be used.

DMT242SC2 is the suitable choice in, for example, plastics drying systems, where the measurement is made by tapping off the dryer system and bringing a small air stream to the sensor. The swagelok connectors of DMT242SC2 easily connect to a cooling coil or tubing providing the essential function of cooling the dry air to ambient temperature before it reaches the sensor.



0801-069

Figure 12 Sampling Cells DMT242SC2 (left) and DMT242SC (right)

where

- 1 = Male pipe welded connector Swagelok 1/4"
- 2 = G1/2"
- 3 = G1/4"
- 4 = G3/8"

DSC74 Sampling Cell with Quick Connector and Leak Screw

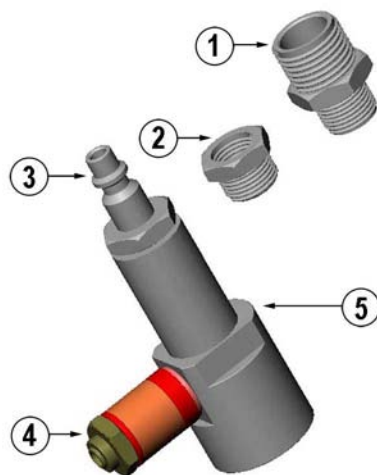
The DSC74 has been designed especially for compressed air lines. The sampling cell contains an adjustable leak screw that allows keeping up the pipeline pressure at the sensor. The leak screw is opened and closed with a screwdriver. The leak screw should be 1/2 turn open. This can be verified by first closing the leak screw, then turning 1/2 turn to open it. Then the air coming out will make a barely audible little hiss and it can be lightly felt when putting a hand in front of the air stream.

NOTE

Do not open the leak screw more than 1/2 turn to avoid reducing the pressure in the sampling cell.

The DSC74 comes with a quick connector that fits to industry standard compressed air line connectors (suitable for type D, Quick08, NIP08). This allows for easy installation and detachment of the dewpoint transmitter without having to shut down the process. Alternative ways to connect are through the two different thread adapters (G3/8" to G1/2" and G3/8" to G1/4" ISO) that are supplied with each DSC74 unit.

When using the DSC74, seal the threads of the quick connector or thread adapter carefully with PTFE thread seal tape. Tighten with an open-end wrench.



0507-105

Figure 13 DSC74 Sampling Cell with Accessories

where

- 1 = Thread adapter type G3/8" - G1/2"
- 2 = Thread adapter type G3/8" - G1/4"
- 3 = Quick connector
- 4 = Leak screw
- 5 = Sampling cell body (DMT242SC)

DSC74B Two Pressure Sampling Cell

The DSC74B and DSC74C sampling cells are enhanced versions of the DSC74. The body is designed in a way that it is possible to measure at both system pressure and atmospheric pressure.

The DSC74B limits the flow rate with a fixed leak screw. The flow is optimized for pressures 3 ... 10 barg. The fixed leak screw eliminates the risk of opening the leak screw fully by accident and this way emptying a gas vessel. The maximum flow can be increased, if needed, by removing the leak screw and adjusting the flow manually with the valve. Harmful gases can be recovered by connecting a collection system at the outlet (not available from Vaisala).

In the basic operation of the DSC74B, the gas flows to the sensor from the front and the outlet is on the side. To have the measurement done at atmospheric pressure, the inlet and outlet are reversed. Then the reducing parts supplied (G3/8" - G1/2" or G3/8" - G1/4") on the outlet side help to protect the sensor from ambient humidity coming in.

DSC74B parts are:

- Sampling cell, thread 3/8"G
- Connection part with a needle valve and an integrated leak screw
- Reducing Nipple (thread adapter), G3/8" - G1/2"
- Reducing Adapter (thread adapter), G3/8" - G1/4"

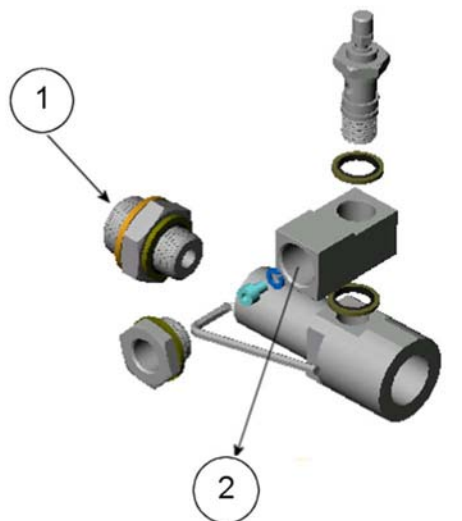


Figure 14 DSC74B

where

- 1 = Gas goes in
- 2 = Gas comes out



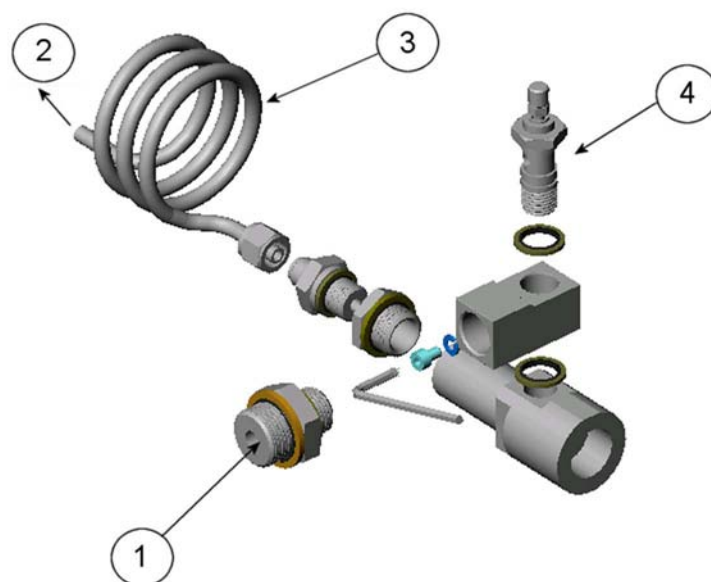
Figure 15 Removing the Leak Screw

DSC74C Two-Pressure Sampling Cell with Coil

The DSC74C with an outlet coil is designed for the most critical measurements at atmospheric pressure. In the DSC74C, the coil is connected to the sampling cell outlet to protect the sensor from ambient humidity disturbing the measurement. The coil can also be used as a cooling coil for sampling from high temperature processes.

DSC74C parts are:

- Sampling cell, thread G3/8"
- Connection part with a needle valve and an integrated leak screw
- Reducing Nipple (thread adapter), G3/8" - G1/2"
- Reducing Adapter (thread adapter), G3/8" - G1/4"
- Diffusion coil (for measurements in atmospheric pressure)

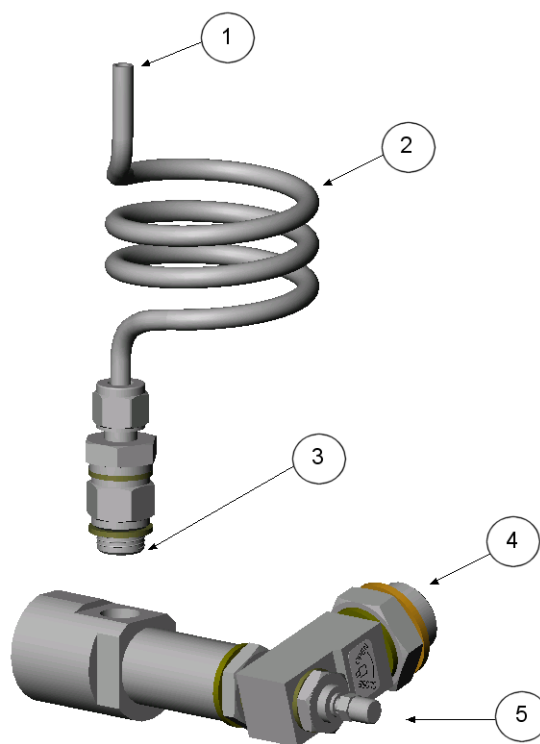


0510-034

Figure 16 Default Assembly of DSC74C

where

- | | | |
|---|---|--|
| 1 | = | Gas goes in. The coil can also be used here. |
| 2 | = | Gas comes out |
| 3 | = | Coil |
| 4 | = | Valve |



0403-113

Figure 17 **Alternative Assembly of DSC74C (for Tight Spaces)**

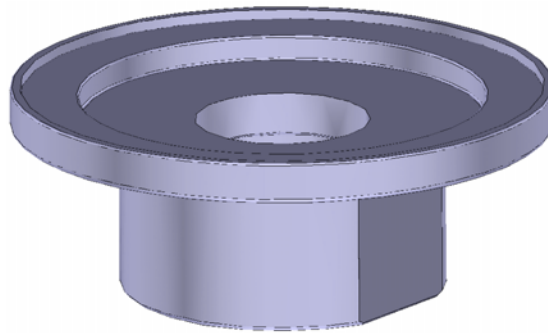
where

- 1 = Gas comes out
- 2 = Coil
- 3 = Thread, max. size 7 mm
- 4 = Gas goes in
- 5 = Valve

The thread size cannot exceed 7 mm. Use the provided adapter to avoid damage to the probe.

NW40 Mounting Flange

An NW40 mounting flange (Vaisala order code 225220SP) is available for installations through thin chamber walls or into vacuum processes.



0908-085

Figure 18 **NW40 Mounting Flange**

CHAPTER 5

OPERATION

This chapter contains the operating instructions and serial line commands for the Dewpoint Transmitter DMT152.

Serial Communication

Connecting to the Serial Interface

The DMT152 can be connected to a PC using the RS-485 line on Port II. You can use, for example, the USB serial interface cable (Vaisala order code 219690). The cable also provides enough operating power for transmitter configuration purposes from the USB port. For continuous measurement, it is recommended to supply the transmitter with operating power from another cable. See section Power Supply Requirements on page 22.

If you have not used the DMT152 USB serial interface cable before, install the driver that came with the cable. Refer to section Installing the Driver for the USB Cable below for detailed instructions.

Installing the Driver for the USB Cable

Before taking the USB cable into use, you must install the provided USB driver on your PC. When installing the driver, you must acknowledge any security prompts that may appear. The driver is compatible with Windows 2000, Windows XP, Windows Server 2003, and Windows Vista.

1. Check that the USB cable is not connected. Disconnect the cable if you have already connected it.
2. Insert the media that came with the cable, or download the driver from www.vaisala.com.
3. Execute the USB driver installation program (setup.exe), and accept the installation defaults. The installation of the driver may take several minutes.

4. After the driver has been installed, connect the USB cable to a USB port on your PC. Windows will detect the new device, and use the driver automatically.
5. The installation has reserved a COM port for the cable. Verify the port number, and the status of the cable, using the **Vaisala USB Instrument Finder** program that has been installed in the Windows Start menu.

Windows will recognize each individual cable as a different device, and reserve a new COM port. Remember to use the correct port in the settings of your terminal program.

There is no reason to uninstall the driver for normal use. However, if you wish to remove the driver files and all Vaisala USB cable devices, you can do so by uninstalling the entry for **Vaisala USB Instrument Driver** from the **Add or Remove Programs (Programs and Features)** in Windows Vista) in the Windows Control Panel.

Terminal Application Settings

The default settings of the DMT152 serial interface are presented in Table 4. If the settings of your DMT152 have been changed and you do not know what they are, refer to section Unknown Serial Settings on page 60.

Table 4 DMT152 Default Serial Interface Setting

Property	Description / Value
Baud rate	19200
Parity	None
Data bits	8
Stop bits	1
Flow control	X _{on} /X _{off} (none)

The steps below describe how to connect to the DMT152 using the PuTTY terminal application for Windows (available for download at www.vaisala.com) and a USB serial interface cable:

1. Connect the USB serial interface cable between your PC and the RS-485 port of the DMT152 (connector II).
2. Start the PuTTY application.

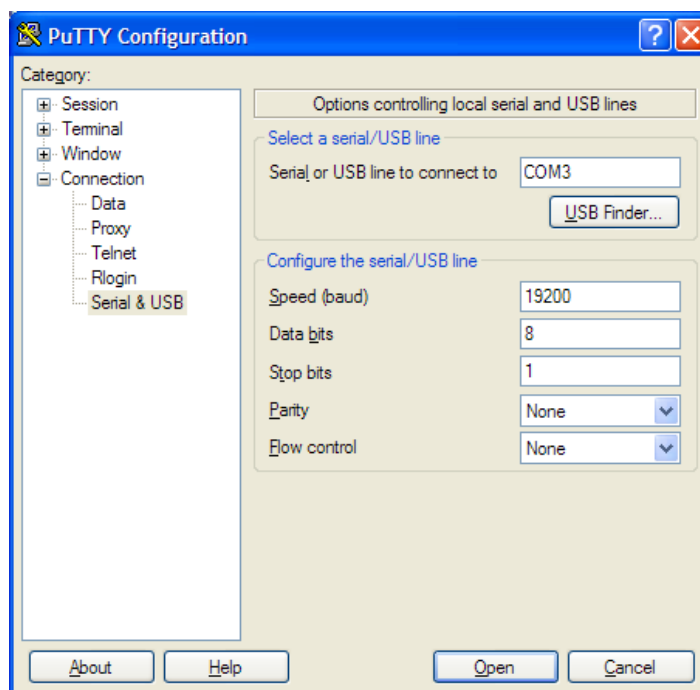
3. Select the **Serial** settings category, and check that the correct COM port is selected in the **Serial line to connect to** field.

Note: You can check which port the USB cable is using with the **Vaisala USB Instrument Finder program** that has been installed in the Windows Start menu.

4. Check that the other serial settings are correct for your connection, and change if necessary. **Flow control** should be set to **None** unless you have a reason to change it.
5. Click the **Open** button to open the connection window and start using the serial line.

Note: If PuTTY is unable to open the serial port you selected, it will show you an error message instead. If this happens, restart PuTTY and check the settings.

6. You may need to adjust the **Local echo** setting in the **Terminal** category to see what you are typing on the serial line. To access the configuration screen while a session is running, click the right mouse button over the session window, and select **Change Settings...** from the pop-up menu.



0807-004

Figure 19 PuTTY Terminal Application

List of Serial Commands

All commands can be issued either in uppercase or lowercase. In the command examples, the keyboard input by the user is in **bold** type.

The notation <cr> refers to pressing the carriage return (**Enter**) key on your computer keyboard. Enter a <cr> to clear the command buffer before starting to enter commands.

Table 5 DMT152 Serial Commands

Command	Description
?	Show device information
??	Show device information (overrides poll mode)
ACAL [1/2]	Calibrate analog channel
ADDR [0 ... 99]	Set the transmitter address for POLL mode
AERR	Set analog output device malfunction error mode
ALARM	Set analog output limit alarm modes
AMODE	Set analog output mode
AOVER [ON/OFF]	Allow analog outputs to exceed their range 10%
ASEL	Configure analog output quantities and scaling
ATEST	Test analog outputs
CLOSE	Close the temporary connection and return the device to POLL mode
ERRS	Display the currently active errors
FORM	Change the format of the measurement output
FRESTORE	Restore factory settings
HELP	Display the command list
INTV [0 ... 255 S/MIN/H]	Set the continuous output interval (for RUN mode and R command)
LED	Set voltage for LED alarm (not needed with Vaisala LED cable)
MOL	Set the molar mass of the process gas (used in ppm _w calculation)
OPEN [0 ... 99]	Open temporary connection to a device that is in POLL mode
PRES	Set value for pressure compensation
R	Start the continuous outputting
RESET	Reset the transmitter
S	Stop the continuous outputting
SDELAY [0 ... 255]	Set response sending delay in milliseconds
SEND [0 ... 99]	Output the reading once
SERI	Set the serial interface settings
SMODE [RUN/POLL/STOP]	Set the serial interface mode
STAT	Display transmitter status
STATUS	Set analog output purge status alarm
TIME	Set time for transmitter clock
UNIT	Select metric or non-metric units
VERS	Display transmitter software version
XPRES	Set value for pressure compensation (temporarily, is cleared at reset)
XPUR [ON/OFF]	Enable or disable sensor purge (temporarily, is enabled at reset)

Device Information and Status

Show Device Information

The **?** command outputs a listing of device information.

?<cr>

Example:

```
?
DMT152/1.10
Serial number : D1930026
Batch number  : D1330070
Module number  : ?????????
Sensor number  : C1420000
Cal. date     : 20080512
Cal. info     : Vaisala/HEL
Serial mode    :      STOP
Baud P D S    :      19200 N 8 1
Output interval:      1 S
Address       :      0
Pressure      : 1.0132 bar
Filter        :      1.000
Ch1 output    : 0 ... 5 V
Ch2 output    : U ALARM
Ch1 Tdf lo    : -80.00 'C
Ch1 Tdf hi    :  20.00 'C
Ch2 Tdf lo    :   0.00 'C
Ch2 Tdf hi    :   0.00 'C
```

If the transmitter is in poll mode, but a connection has not been opened using the **OPEN** command, issue the **??** command. For a description of the serial interface modes, see section Set Serial Interface Mode on page 44.

??<cr>

Show Transmitter Status

The **STAT** command displays the status of the transmitter in four characters.

STAT<cr>

The characters in the output have the following meaning:

[sensor purge] - [output frozen] - [settling] - [status]

During normal measurement all characters are zeroes. When purge is activated, output frozen, or the transmitter is in the settling period after sensor purge, the corresponding status character is 1.

The final status character can have several values:

- 0 = Normal status
- 1 = Transmitter error
- 7 = Retrying auto-calibration due to fluctuations in the supply voltage
- 9 = Transmitter startup

Some example status codes:

0109 Transmitter performing startup procedure
1100 Sensor purge in progress, output frozen
1110 Settling period after purge, output frozen
0000 Normal measurement

Example:

```
stat  
0000
```

NOTE	It is normal for measurement output to freeze temporarily if the measurement environment is changing rapidly.
-------------	---

Show Firmware Version

VERS<cr>

Example:

```
vers  
DMT152 / 1.10
```

Configuring Analog Outputs

The DMT152 has two analog output channels. These channels can function either as normal measurement channels, or produce an ON/OFF output if the measurement exceeds a given alarm level (limit alarm) or if the measurement reading is frozen (for example, during sensor purge).

- In the normal operation mode, a channel outputs voltage or current that corresponds to the reading of the selected quantity.
- In the ON/OFF output mode, a channel outputs a specified voltage or current level. This mode is used by the limit alarm and the purge status alarm.
- In the LED alarm output mode, the channel outputs operation voltage for the LED cable. The LED will light up to indicate a frozen measurement output which is typically caused by transmitter start-up or sensor purge. The LED will blink at approximately 0.5 Hz if the malfunction alarm is active. The LED will not light up for the limit alarm.

Additionally, DMT152 has a malfunction alarm that is always enabled in normal operation mode. The malfunction alarm can also be enabled for a channel in ON/OFF output mode. See section Malfunction Alarm on page 40.

When the transmitter is ordered from Vaisala, the modes are configured as specified in the order form. You can change the operation settings after delivery using the **AMODE** command:

AMODE [*c1 c2*]<cr>

where

- c1** = Channel 1 analog output mode. Available options are:
- 1 = 0 ... 20 mA
 - 2 = 4 ... 20 mA
 - 4 = 0 ... 5 V
 - 5 = 0 ... 10 V
 - 7 = I alarm (ON/OFF output using current)
 - 8 = U alarm (ON/OFF output using voltage)

Modes 1 ...5 are normal measurement modes, where malfunction alarm is always enabled, and limit alarm and purge status alarm are disabled.

where

c2 = Channel 2 analog output mode. Available options are:

1 = 0 ... 20 mA

2 = 4 ... 20 mA

4 = 0 ... 5 V

5 = 0 ... 10 V

6 = LED alarm

7 = I alarm (ON/OFF output using current)

8 = U alarm (ON/OFF output using voltage)

Enable mode 6 for channel 2 if you are using the Vaisala LED cable.

Example:

amode 2 1

Ch1 output : 4 ... 20 mA

Ch2 output : 0 ... 20 mA

Limit Alarm

The limit alarm is activated when the measured quantity goes below the low limit or above the high limit. The alarm can be specified during ordering for a specified parameter, or configured on the serial line using the **ALARM** command.

When ordering a limit alarm, the alarm levels are set as follows:

- For **current output**, an active alarm is indicated by the current being at the maximum of the scale (20 mA).
- For **voltage output**, an active alarm is indicated by the voltage being at the maximum of the selected scale. For example, if the voltage output scale is 0 ... 5 V, an output of 5 V indicates the alarm is active.

Using the **ALARM** command, you can also set a hysteresis value to prevent the repeated triggering of the alarm when the measurement fluctuates around a limit value.

ALARM<cr>

The following example shows that a high limit alarm has been enabled for channel 1. If the measured value rises above the -40.00 °C T_d limit, analog channel 1 is set to 5 V (Limit Hi = -40.00, Level Hi = 5.00). The malfunction alarm (aerr) is disabled for both channels.

alarm ?

Channel 1:

Low Limit : OFF

High Limit : ON

Aerr : OFF

Quantity : Tdf

Limit Lo : 0.00


```

Limit Hi      :    -40.00
Hysteresis    :      0.00
Level Lo      :      0.00
Level Hi      :      5.00
Channel 2:
Low Limit     :      OFF
High Limit    :      OFF
Aerr          :      OFF
Quantity      :      ppm
Limit Lo      :      0.00
Limit Hi      :      0.00
Hysteresis    :      0.00
Level Lo      :      0.00
Level Hi      :      0.00

```

NOTE

Avoid enabling more than one alarm type for a channel.

Purge Status Alarm

The transmitter can temporarily freeze the output when measurement is not possible (for example, during sensor purge). The purge status alarm indicates this state by setting the analog output at a defined level, in the same way as the limit alarm (see page 38).

Use the **STATUS** command to enable/disable the alarm and to define the voltage/current levels (see example below). The channel is set to the value of **Level Hi** when sensor purge is active and to **Level Lo** during normal operation. During auto-calibration, the output is not frozen, that is, the output of the purge status alarm is on Level Lo.

STATUS<cr>

The following example shows the purge status alarm enabled for channel 1:

```

status
Channel 1:
Status      :      ON      ?
Level Lo    :      0.00    ?
Level Hi    :      5.00    ?
Channel 2:
Status      :      OFF     ?
Level Lo    :      0.00    ?
Level Hi    :      0.00    ?

```

Level Lo and **Level Hi** are shared between the **STATUS** and **ALARM** commands. For example, if you change the levels using the alarm command, they will also change when viewing the status command.

Malfunction Alarm

If the transmitter is malfunctioning, the channel output is set to a pre-defined level. This overrides the normal measurement output of the channel. You can specify the level using the **AERR** command:

AERR<cr>

Example:

```
aerr
Ch1 error out : 20.000 mA ?
Ch2 error out : 0.000 V ?
```

The current value is shown after the colon ":". To set a new value, enter it after the question mark. The error output value must be within the valid range for the selected output mode.

NOTE

The error output value is displayed only when there are minor electrical faults such as a humidity sensor damage. When there is a severe device malfunction, the error output value is not necessarily shown.

The malfunction alarm is always enabled for channels that are in the normal measurement modes (see section Configuring Analog Outputs on page 37), but you can enable or disable it using the **ALARM** command for channels that are in the ON/OFF output mode.

Select Analog Output Quantity and Scaling

Use the **ASEL** command to select the quantities output by the analog channels. Refer to Table 6 on page 42 for the selectable quantities. After entering the command, you will be prompted to enter the scaling of the quantities for both channels. Press enter to accept the suggested scaling values.

ASEL [xxx yyy]<cr>

where

xxx = Analog channel 1 output quantity
yyy = Analog channel 2 output quantity

Example:

```
asel tdf ppm
Ch1 Tdf lo : -80.00 'C ?
Ch1 Tdf hi : 20.00 'C ?
Ch2 ppm lo : 0.00 ppm ?
Ch2 ppm hi : 1000000.00 ppm ?
```

Configuring Serial Line Operation

Set Serial Line Settings

Use the **SERI** command to set the serial line settings. The new settings will be taken into use when the transmitter is reset or powered up. Note that the transmitter will use its default serial line settings if it is in error state; see section Error State on page 60.

Also note that changing the serial line settings will slightly alter how the transmitter works with the MI70 indicator. If you are not using the default settings of 19200 N 8 1, you will have to power off the MI70 before it can find the transmitter (you cannot connect it on-the-fly).

SERI [*b p d s*]<cr>

where

B = baud rate (300, 600, 1200, 2400, 4800, 9600, or 19200)

P = parity (n = none, e = even, o = odd)

D = data bits (7 or 8)

S = stop bits (1 or 2)

Example:

```
seri 9600 e 7 1
Baud P D S      :      9600 E 7 1
```

Set Serial Line Response Time

With the **SDELAY** command you can set delay (response time) of the serial line or view the currently set delay value. Increasing the value by one increases the delay by 4 milliseconds. For example, value of 5 equals ~20 ms answer delay.

SDELAY [*x*]<cr>

where

x = Serial line delay (0 ... 255)

Example:

```
sdelay 1
Serial delay  :      1
```

Set Transmitter Address

To operate in the POLL mode, the transmitter must have an address. If multiple transmitters share the same serial line, each transmitter must have a different address.

For a description of the serial interface modes, see section Set Serial Interface Mode on page 44.

ADDR [*nn*]<cr>

where

nn = address (0 ... 99)

Example:

```
addr 1
Address      :      1
```

Format the Measurement Output

Use the serial line command **FORM** to change the format or select the quantities for the output commands **SEND** and **R**. You can return to the default format using the '**FORM /**' command.

FORM [*x*]<cr>

where

x = Formatter string

Formatter string consists of quantities and modifiers. The maximum length of the form string is 74 characters. When entering the command, use the abbreviations of the quantities. The quantities are presented in Table 6, and modifiers in Table 7.

Table 6 FORM Command Quantities

Quantity	Description
TDF	Dewpoint/frost point temperature
PPM	Water content in parts per million
PPB	Water content in parts per billion
PPMW	Water content in parts per million by weight
	Note: For accurate ppm, ppb, or ppmw reading, you must compensate for the pressure and molar mass of the process gas.

Table 7 FORM Command Modifiers

Modifier	Description
x.y	Length modifier (number of digits and decimal places)
#t	Tabulator
#r	Carriage-return
#n	Line feed
"	String constant
#xxx	ASCII code value (decimal) of a special character; for example, #027 for ESC
ADDR	Transmitter address with two characters [00...99]
ERR	Currently active transmitter errors in a nine bit field: bit0 ... bit8. bit0 T MEAS error bit1 F meas error bit2 Voltage too low error bit3 Voltage too low for mA output error bit4 Ambient temperature error bit5 Flash checksum error bit6 Parameter checksum error bit7 Autocalibration error bit8 Internal error
STAT	Transmitter status in 4 characters. The status codes are the same as for the STAT command; see section Show Transmitter Status on page 36.
SN	Transmitter serial number
TIME	Current time; see the description of the TIME command on page 51.
Ux	Shows the name of the measurement unit using "x" number of characters. For example, U3 shows the name of the measurement unit with three characters.

Examples:

```
form 4.2 TDF #r #n
OK
```

```
form 3.1 "H2O= " ppm " " U3 #r #n
OK
```

Select Unit

The DMT152 Transmitter outputs dewpoint temperature T_d in either Celsius or Fahrenheit degrees depending on the unit selection. The unit selection also affects the unit (bar_a or psi_a) for the pressure compensation.

UNIT [x]<cr>

where

x = Selects the unit type to output:
 m = metric units (for example, celcius)
 n = nonmetric units (for example, fahrenheit)

Set Serial Interface Mode

SMODE [xxx]<cr>

where

xxx = STOP, RUN, or POLL

In STOP mode: outputting only when command is issued, any command can be used.

In RUN mode: outputting automatically, only command **S** can be used.

In POLL mode: outputting only when command is issued, any command can be used after the line has been opened using the **OPEN** command.

The polling mode can be used when more than one transmitter is connected to one serial bus. When set to POLL state, the transmitters communicate one at a time when the specific transmitter address is called on the serial line. See descriptions of the commands **ADDR** on page 42 and **OPEN** on page 50.

Examples:

```
smode stop  
Output mode      : STOP
```

```
smode run  
Output mode      : RUN
```

```
smode poll  
Output mode      : POLL
```

Configuring Measurement Parameters

Enable or Disable Sensor Purge

You can temporarily disable the sensor purge function using the **XPUR** command. Note that disabling the sensor purge will affect the measurement performance of the transmitter.

XPUR [ON/OFF]<cr>

Example:

```
xpur off  
Purge           : OFF
```

After giving the **XPUR OFF** command, the transmitter will not perform sensor purge until one of the following events takes place:

- Transmitter is reset or powered up
- Sensor purge is enabled using the **XPUR ON** command

Set Pressure Value for ppm Calculation

The DRYCAP® 180U sensor in the DMT152 is not pressure-dependent. When measuring dewpoint, pressure compensation is not needed. However, in the calculation of ppm volume concentration, the pressure of the system must be known. If you did not specify pressure compensation when ordering the product, use the commands below to enable the pressure compensation and set the pressure value.

PRES [pp.pppp]<cr>

XPRES [pp.pppp]<cr>

where

pp.pppp = Absolute pressure in the measuring point. The unit is bar_a if metric units have been selected, and psi_a if non-metric units are used.

Command **XPRES** should be used if the value is changed frequently. The value set using the **XPRES** command overrides the **PRES** value, but it is not retained at reset. When the **XPRES** is set to 0, the last value set with **PRES** is used instead.

Example:

```
pres 1.01325
Pressure      : 1.01325 bar
```

The pressure conversion coefficients from other pressure units to bars is given in the table below.

Table 8 Pressure Conversion Coefficients

From	To bar _a
PaN/m ²	0.00001
mmHg torr	0.001333224
inHg	0.03386388
mmH ₂ O	0.00009806650
inH ₂ O	0.002490889
atm	1.01325
at	0.980665
psi _a	0.06894757

Example:

$$29.9213 \text{ inHg} = 29.9213 \times 0.03386388 = 1.01325 \text{ bar}_a$$

NOTE

Conversions from mmHg and inHg are defined at 0 °C and from mmH₂O and inH₂O at 4 °C.

NOTE

You can also set the pressure compensation value when you connect the DMT152 to the MI70 indicator. When using the MI70, the pressure unit is bar_a.

Set Molar Mass for ppmw Calculation

Use the **MOL** command to view and set the molar mass of the gas in the measurement environment. The molar mass parameter is used in calculating H₂O ppm_w. Some typical molar masses are:

- Air 28.96 g/mol
- N₂ 28.0134 g/mol
- O₂ 32.00 g/mol
- SF₆ 146.06 g/mol

MOL [n]<cr>

where

n = Molar mass (in g/mol) of the gas in the measurement environment

Examples:

```
mol 146.06
Mol                : 146.0600

mol
Mol                : 146.0600      ?
```

NOTE

You can also set the molar mass when you connect the DMT152 to the MI70 indicator.

Serial Line Output Commands

Start Measurement Output

Use the **R** command to start the continuous outputting of measurement values as an ASCII text string to the serial line. The format of the measurement message is set with the **FORM** command.

R<cr>

Example (measurement message in default format):

```
r
Tdf= -2.5 'C H2O= 4919 ppm
Tdf= -2.5 'C H2O= 4918 ppm
Tdf= -2.5 'C H2O= 4917 ppm
...
```

Outputting the results continues in intervals issued with the command **INTV**. You can stop the output by pressing the **Esc** key, or with the command **S**. Since the interface is half-duplex, you must enter the commands when the transmitter is not outputting.

Stop Measurement Output

You can stop the measurement output by pressing **Esc**, or with the **S** command:

S<cr>

Set Output Interval

INTV [*n xxx*]<cr>

where

<i>n</i>	=	time interval = 0 ... 255
<i>xxx</i>	=	time unit = "S", "MIN", or "H"

Example:

```
intv 1 min
Output interval: 1 MIN
```

The shortest output interval (with *n* = 0) is approximately one second due to the internal measurement cycle.

Output a Reading Once

SEND [*aa*]<cr>

where

aa = Transmitter address (0 ... 99). Must be specified if the transmitter is in POLL mode, and a line has not been opened using the **OPEN** command.

Example:

```
send  
Tdf= -2.0 'C H2O= 5152 ppm
```

Troubleshooting and Maintenance Commands

Display the Currently Active Errors

Use the **ERRS** command to display the currently active transmitter error codes. Possible errors and their causes are listed in Table 9 on page 61.

ERRS<cr>

Example:

```
errs  
Voltage too low error
```

Test Analog Outputs

The operation of the analog outputs can be tested with the **ATEST** command by forcing the output to a given value which can then be measured with calibrated multimeter. The command uses the currently selected analog output types for the channels (voltage or current) so you do not have to specify the unit.

Before testing, you can verify the currently set analog output modes using the **AMODE** command. After testing the output, give the **ATEST** command again to exit the test mode.

ATEST [*xxx yyy*]<cr>

Where

<i>xxx</i>	=	Channel 1 output value (V or mA)
<i>yyy</i>	=	Channel 2 output value (V or mA)

The output shows the test values of the analog channels as well as diagnostic information that may be useful to Vaisala Service if there is a problem with the analog outputs.

Example:

```
atest 1 15
      1.00      2660
      15.00     19425

atest
      0.00      79
      0.00     20110
```

Calibrate Analog Output

Use the **ACAL** command to force the analog outputs to the following values:

- Current output: 2 mA and 18 mA
- Voltage output: 10 % and 90 % of the range

After entering the **ACAL** command, use a calibrated current/voltage meter to measure the output, and enter the values. Note that the calibration is only valid for the currently selected analog output modes.

ACAL [*channel*]

where

Channel = Analog output channel: 1 or 2

Example:

```
acal 1
Ch1:
I1 ( mA ) ? 0.166
I2 ( mA ) ? 18.1
3.61058569E+02 1.40927863E+03
```

Extend Analog Output Range

Use the **AOVER** command to allow the analog output channels to exceed their specified range by 10%. The scaling of the quantity remains as before; the extra range is used for additional measurement range in the wet end.

AOVER [*ON/OFF*]<cr>

The following example illustrates how the analog output is affected. Channel 1 outputs T_d with voltage output 0 ... 5 V (-80 °C ... -30 °C). After giving the **AOVER ON** command, the range is 0 ... 5.5 V (-80 °C ... -25 °C). Note that the -30 °C T_d point is still at 5 V.

Example:

```
aover on
      : ON
```

Other Commands

Opening the Transmitter in POLL Mode

Use the **OPEN** command to connect to a transmitter that is in POLL mode.

OPEN [*aa*]<cr>

where

aa = address (0 ... 99)

Example:

```
open 1
DMT152 1 line opened for operator commands
```

Closing the Connection to a Transmitter in POLL Mode

The **CLOSE** command closes the connection to a transmitter.

CLOSE<cr>

Example:

```
close
line closed
```

Display Command List

HELP<cr>

Set Time

Use the **TIME** command to view and set the transmitter clock. The clock does not have a battery backup – it is reset to 00:00:00 when the transmitter is powered up or reset.

TIME [*hh mm ss*]<cr>

where

hh	=	Hours (24-hour clock)
mm	=	Minutes
ss	=	Seconds

Example:

```
time 12 30 00
12:30:00
```

```
time
12:30:05
```

Reset Transmitter

When the **RESET** command is given, the transmitter will restart as if it had just been powered on. All transmitter settings are retained. The serial line mode of the transmitter will be set to the mode that was set using the **SMODE** command.

As the transmitter starts up, it performs the startup sensor purge and auto-calibration before resuming measurement.

RESET<cr>

Set LED Voltage

With the **LED** command, you can set the supply voltage that is provided to the LED when the LED alarm mode is used. If you are using the Vaisala LED cable, leave this setting at the default voltage (2.80 V).

LED<cr>

Example:

```
led
Ch 1 Led Voltage      :      2.80 V
Ch 2 Led Voltage      :      2.80 V
```

Restore Factory Settings

Use the **FRESTORE** command to restore the factory settings to the transmitter. All user settings will be lost.

FRESTORE<cr>

CHAPTER 6

MAINTENANCE

This chapter provides information on the maintenance of Dewpoint Transmitter DMT152.

Cleaning the Transmitter

The body of the transmitter can be cleaned by wiping with a moistened lint-free cloth. Do not immerse the transmitter in liquid and do not use cleaning agents or solvents.

Do not attempt to clean the filter or the sensor element. If the filter is contaminated, replace it with a new one.

Changing the Filter

If the filter is contaminated, it should be replaced. New filters can be ordered from Vaisala, with the order code 220957. Be careful when changing the filter, since it is easy to break the sensor when the filter is removed.

CAUTION

If the transmitter is installed in a pressurized chamber, always make sure that the pressure of the chamber is equalized with the ambient pressure prior to removing the transmitter. When the transmitter is removed for maintenance, cap the hole with a capped nut. This way, the process can be running although the transmitter is not in place.

Plugs are available from Vaisala for ISO threaded connections (Vaisala order code 218773) and NPT threaded connections (Vaisala order code 222507).

When replacing the filter, note the following:

- The pores of the steel mesh may become blocked if touched. Do not touch the filtering surface with your hands or any tools. Always handle the filter from the top of the filter body.
- Touching the filter with your fingers will also deposit oil and dirt on the filter, which may affect the measurement. Always handle the filter with gloved hands.
- When installing the transmitter after a filter change, always use a new sealing ring (ISO and UNF threads only).

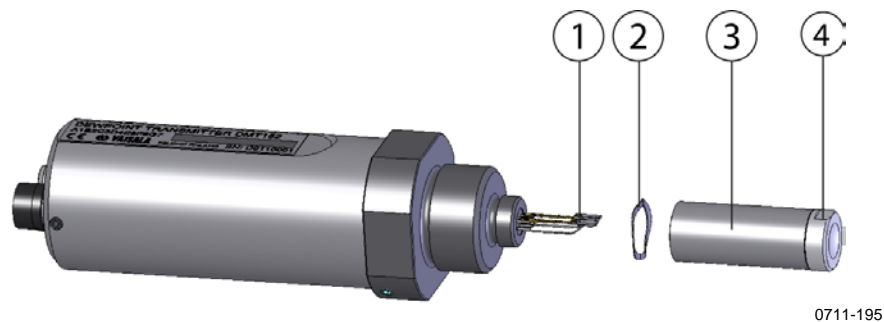


Figure 20 **Filter Structure**

where

- 1 = Vaisala DRYCAP® sensor
- 2 = Spring washer
- 3 = Stainless steel mesh filter (do not touch)
- 4 = Top of the filter

Replace the filter as follows:

1. Grip the old filter from the top of the filter body using an 11 mm socket wrench. Turn the filter counterclockwise until it is loose.
2. Pull the filter straight out carefully; do not damage the sensor, and do not lose the spring washer.
3. Take the new filter, and insert it to the filter threads. The spring washer should be under the filter.
4. Tighten the new filter by turning it clockwise with the 11 mm socket wrench. Tighten to 5 N m.

Calibration and Adjustment

The DMT152 is fully calibrated as shipped from factory. The recommended calibration interval is 2 years. If the transmitter is used in the wet end of the measurement range, calibration should be done every year. Calibration should also be done if there is a reason to believe that the device is not within the accuracy specifications.

You can perform a simple field checking operation by comparing the readings of the DMT152 and the DM70 hand-held dewpoint meter with a calibrated reference probe. For more information, see section Field Check Using DM70 on page 55.

If there is need for calibration or adjustment, contact a Vaisala Service Center or your local Vaisala representative. See section Technical Support on page 62.

Field Check Using DM70

To check of the accuracy of the DMT152 in the field, you need the following equipment:

- A fully charged MI70 indicator (the measurement display that is included in the DM70 package)
- A calibrated reference probe that is suitable for the intended measurement environment and dewpoint range. You can use a DMP74 probe from the DM70 for dewpoint down to -60 °C (-76 °F), or a second DMT152 for full measurement range.
- A connection cable between DMT152 and the MI70 indicator (Vaisala order code 219980).
- A reference environment with a stable dewpoint and temperature in a suitable range for both probes. The normal measurement environment of the transmitter can also be used, if it meets these criteria.

NOTE

In the procedure below, the readings of the probes are checked individually. You can also perform the field check so that you connect the reference probe simultaneously with the DMT152 you are checking. In this case, you need two of the connection cables if you are using a DMT152 also as the reference probe. Also, you must power one of the transmitters by other means than the MI70.

Perform the check as follows:

1. Place the DMT152 in the reference environment (unless it is already). You can perform the check even if the DMT152 is currently being powered and used, as long as there is no cable connected to connector II.
2. Connect the MI70 connection cable between the MI70 indicator and connector II of the DMT152.
3. Turn on the MI70 indicator. If the analog channels of your DMT152 are configured to use the current output, and if the DMT152 is powered by the MI70, you will see an error message that indicates the supply voltage is too low for running the actual analog output. This is expected behavior; press **OK** to acknowledge the error and continue the field check.

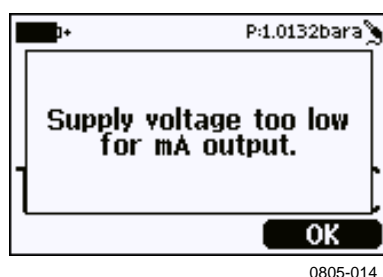


Figure 21 Supply Voltage Too Low for mA Output Error

4. Check and adjust the environment settings if prompted. You can change the pressure compensation value (only needed for ppm calculation) and the molar mass of the measurement gas. The pressure must be entered in bar_a; to enter the value in psi_a, use the serial line. For more information on these settings, see the following sections:
 - Set Pressure Value for ppm Calculation on page 45
 - Set Molar Mass for ppmw Calculation on page 46
5. After a brief delay, the DMT152 should provide an approximate measurement reading of the selected quantities. Remember that it takes up to 15 minutes for the transmitter to start the active measurement. If the desired quantities are not shown on the display, select them from the **Display – Quantities and units** menu.
6. The **Auto power off** function should be disabled on the MI70 indicator to prevent the indicator from powering off in the middle of the check. While waiting for the active measurement to start, check the setting in the **Settings - User Interface** menu, and change if necessary.
7. Write down the Td reading after the measurement has stabilized.
8. Turn off the MI70 indicator and disconnect the DMT152.

9. Insert the reference probe to the measurement environment, and connect it to the MI70 indicator.
10. Turn on the MI70 indicator. Check and adjust the environment settings if prompted.
11. Wait for the reference probe to provide a stable reading, and compare it with the reading from the DMT152.

The difference between the readings will give you an indication of the approximate drift of the DMT152 and its need for calibration.

As a general rule, the reading from the DMT152 should be within $\pm 4\text{ }^{\circ}\text{C T}_d$ of the reading from the reference probe.

NOTE

Some notes on using the MI70 indicator with the DMT152:

- If you disconnect the DMT152 while the MI70 indicator is on, the quantities measured will remain on the screen, but no measurement will be shown.
- The messages from the transmitter (such as the supply voltage error) will appear in English even if the MI70 has been set to another language.

This page intentionally left blank.

CHAPTER 7

TROUBLESHOOTING

This chapter describes common problems, their probable causes and remedies, and provides contact information for technical support.

Typical Problems

If you have a problem with the DMT152, first read the following sections concerning the behavior and error indications of the transmitter:

- Configuring Analog Outputs on page 37
- Error Codes on page 61
- Error State on page 60

Possible causes of errors include insufficient supply voltage, excessive supply voltage fluctuation, physical damage to the transmitter, and incorrect connections. Connection problems can be caused by misconfiguration of the analog outputs or the serial line. Also remember that the startup of the transmitter may take up to 15 minutes.

Some problems can be solved by simply resetting the transmitter. You can reset the transmitter by disconnecting the power or issuing the **RESET** command on the serial line.

If you cannot locate the source of the error and return the transmitter to the normal state, please contact Vaisala technical support. See section Technical Support on page 62.

Unknown Serial Settings

If you are not sure what the serial settings of your transmitter are, follow the steps below to view and change them.

1. Make sure there are no other transmitters on the serial line.
2. Provide the transmitter with a 9 V supply voltage. This voltage is enough to start it in the error state.
3. Connect to the serial line using the error state serial line settings 19200 N 8 1.
4. Give the ? command to view the transmitter settings, including the serial settings and address. For an output example, see section Show Device Information on page 35.

You may have to give the command several times if there are characters in the buffer.

5. If necessary, set new serial line settings using the **SERI** command. For instructions on using the command, see page 41.

Error State

If the voltage supplied to the DMT152 is too low for reliable operation, or fluctuates heavily, or there is some serious problem that prevents measurement, the DMT152 will enter an error state. The error state is indicated by the following:

- Analog current output at 0 mA or 4 mA (according to selected range)
- Analog voltage output at 0V
- Serial line outputs asterisk characters "*" instead of measurement data. For example: Tdf=***** 'C H2O=***** ppm

The analog output levels for the error state are configurable using the **AERR** command; see section Malfunction Alarm on page 40. Note that the asterisk characters on the serial line may also appear during the startup procedure.

When the transmitter is in the error state, it will use the default serial interface settings, regardless of the currently set serial interface mode. If you have set a different mode with the **SERI** command, you will have to set your terminal program to the default settings of 19200 N 8 1 (also listed in Table 4 on page 32) before you can connect to the transmitter in error state.

Error Codes

The transmitter has error codes that can be displayed on the serial line using the **ERRS** command. See section Display the Currently Active Errors on page 48.

Table 9 Error Codes

Error Code	Cause
Ambient temperature error	Ambient temperature out of operating range (probably too hot).
Autocal error	Transmitter unable to complete auto-calibration after several attempts. Can be caused by continuously changing measurement environment, problem with supply voltage, or transmitter malfunction.
Voltage error	Supplied operating voltage is too low or high for reliable operation, or there is a problem with voltage measurement.
Voltage too low error	Supplied operating voltage is too low for reliable operation.
Voltage too low for mA output error	Supplied operating voltage is too low for reliable operation of the analog current output. Note: It is normal to receive this error when using the MI70 indicator or the USB serial interface cable, as they do not provide a sufficient operating voltage to operate the current output. To avoid this error, connect a power supply for the transmitter in connector I before connecting the MI70 indicator or USB cable. See section Power Supply Requirements on page 22.
T meas error	Internal error, can be caused by damage to the sensor.
F meas error	Internal error, can be caused by damage to the sensor.
Internal error	Transmitter unable to function. Can be caused by transmitter malfunction or unsuitable measurement environment.
Parameter flash check sum error	Internal error
Program flash check sum error	Internal error
INFOA check sum error	Internal error
SCOEFS check sum error	Internal error
CURRENT check sum error	Internal error
Unknown error	Internal error

Technical Support

For technical questions, contact the Vaisala technical support by e-mail at helpdesk@vaisala.com. Provide at least the following supporting information:

- Name and model of the product in question
- Serial number of the product
- Name and location of the installation site
- Name and contact information of a technically competent person who can provide further information on the problem.

Product Returns

If the product must be returned for service, see www.vaisala.com/services/return.html.

For contact information of Vaisala Service Centers, see www.vaisala.com/services/servicecenters.html.

CHAPTER 8

TECHNICAL DATA

This chapter provides the technical data of Dewpoint Transmitter DMT152.

Measured Variables

Dewpoint temperature	
Measurement range	-80 ... -10 °C (-112 ... +14 °F) T _d
Accuracy	± 2 °C (3.6 °F) T _d
Non-calibrated range	-100 ... +20 °C (-148 ... +68 °F) T _d
Response time 63% [90%] at +20 °C (+68 °F) gas temperature and pressure of 1 bar	
-10 ... -80 °C (+14 ... -112 °F) T _d	0.5 min [7.5 min]
-80 ... -10 °C (-112 ... +14 °F) T _d	2 s [5 s]
Analog output scalings	
option 1	-80 ... +20 °C (-112 ... +68 °F) T _d
option 2	-100 ... 0 °C (-148 ... +32 °F) T _d
option 3	free scaling
ppm volume concentration	
Measurement range	0 ... 500 ppm
Accuracy at +20 °C (+68 °F), 1013 mbar	± (0.2 ppm + 20 % of reading)

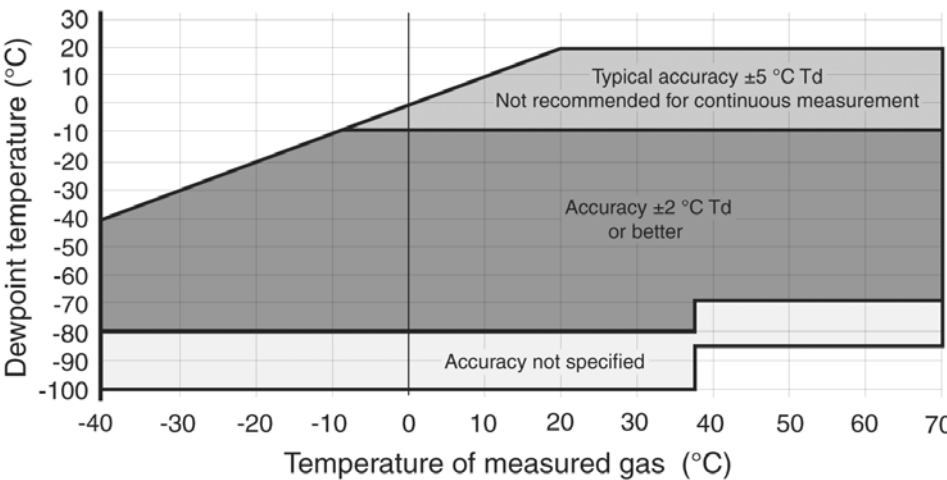


Figure 22 Accuracy Over Temperature Range

When dewpoint is below 0 °C, the transmitter outputs frostpoint for T_d.

Operating Environment

Temperature	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	0 ... 100 %RH (up to +20 °C / +68 °F)
Pressure	0 ... 50 bar (725 psia)
Measured gases	non-corrosive gases
Sample flow rate	no effect on measurement accuracy

Outputs

Two analog outputs (scalable)	0 ... 20 mA 4 ... 20 mA 0 ... 5 V 0 ... 10 V
Accuracy	
voltage output	± 0.01 V
current output	± 0.01 mA
Typical temperature dependence	
voltage output	± 0.001 % of span / °C
current output	± 0.005 % of span / °C
Digital output	RS485 (2-wire half-duplex)
ON/OFF output available instead of the 2 nd analog output	
purge inactive	0 V or 4 mA
purge active	5 V, 10 V or 20 mA
OR exceeded T _d or ppm limit	user selectable

General

Sensor	Vaisala DRYCAP® 180U Thin-film capacitive polymer sensor
Startup time	10 .. 15 minutes
Recommended calibration interval	2 years
Operating voltage with	
RS485 output	11* ... 28 VDC
voltage output	15* ... 28 VDC
current output	21 ... 28 VDC
* For extended temperature down to -40 °C (-40 °F) or pressure up to 50 bar (725 psia) the supply voltage must be 21 ... 28 VDC.	
Operating voltage fluctuation	max. 0.3 V
Supply current	
normal measurement	20 mA + load current
during self-diagnostics	max. 220 mA pulsed
Load for	
voltage output	min. 10 kOhm
current output	max. 500 Ohm

Housing material	AISI316L and PPS
Stainless steel mesh filter	AISI303, filter grade 18 µm
Mechanical connections	
option 1	ISO G1/2"
option 2	NPT 1/2"
option 3	UNF 3/4"-16
Housing classification	IP65 (NEMA 4)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Weight	
With ISO thread	190 g (6.70 oz)
With NPT thread	210 g (7.41 oz)
With UNF thread	186 g (6.56 oz)

Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial environment.

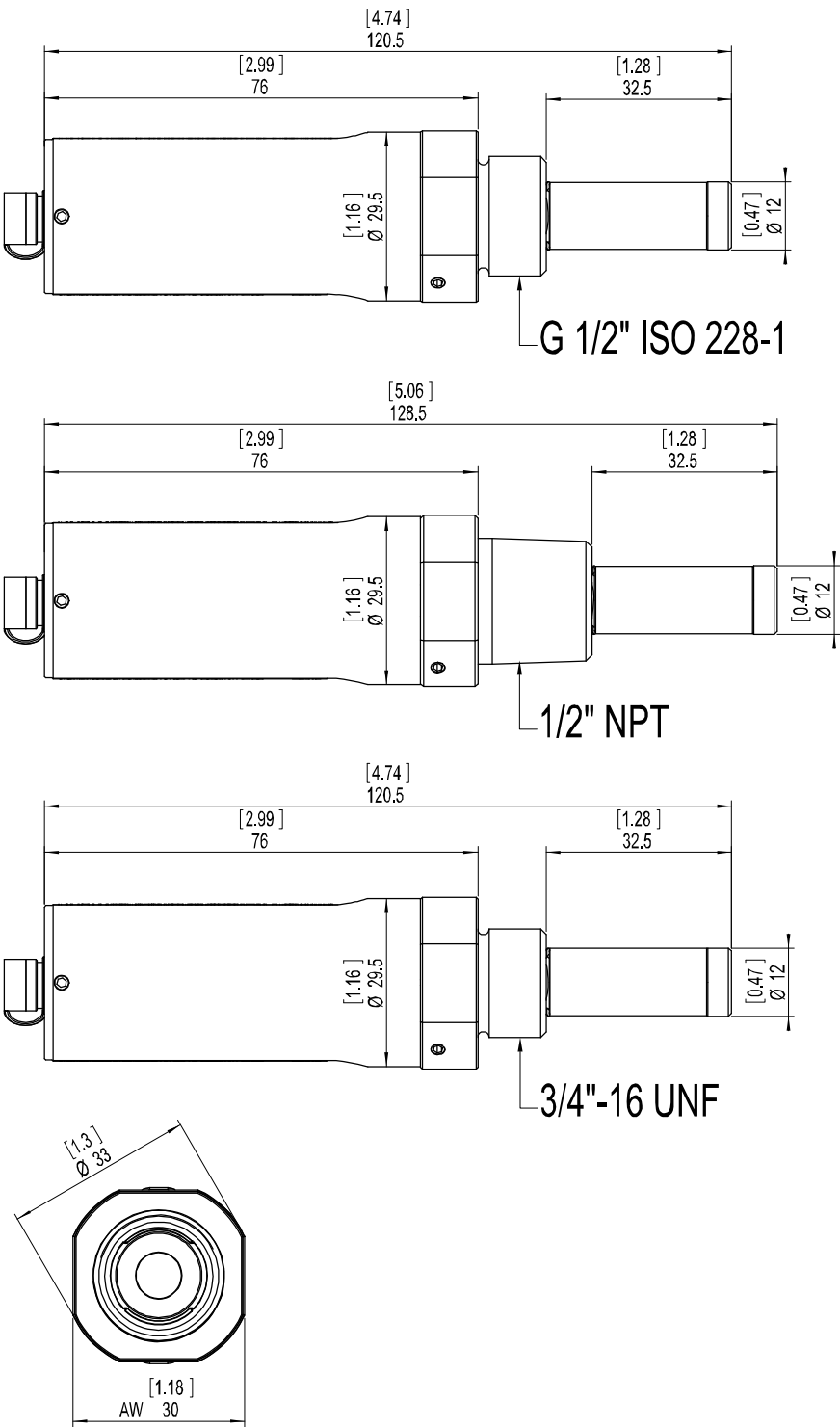
Output Cable Specifications

Connector	Straight, moulded M8 female (IEC 60947-5-2)
Color	Black
Number of contacts	4
Conductors	0.25 mm ² (× 4) / 0.00039 inch ² (× 4)
Insulation	PVC
Cable diameter	5.0 mm / 0.2 inch
Protection class	IP67 / NEMA 4
Wire color code	EN50044

Spare Parts and Accessories

Description	Order Code
Connection cable for DM70	219980
USB serial interface cable	219690
Sealing ring set ISO (copper, 3 pcs)	221524SP
Sealing ring set UNF (copper, 3 pcs)	221563SP
Stainless steel mesh filter (18 µm)	220957SP
110 ... 240 VAC external power supply	POWER-1
NW40 mounting flange	225220SP
Plug Kit (ISO 1/2")	218773
Plug Kit (NPT 1/2")	222507
Analog/RS-485 output cables	
2 m (6,5 ft) cable, M8 snap-on connector	211598
3 m (9.8 ft) cable, Ch1 signal + Ch2 LED, M8 threaded connector	MP300LEDCBL
0.32 m (1 ft) shielded cable, M8 threaded connector	HMP50Z032
3 m (9.8 ft) shielded cable, M8 threaded connector	HMP50Z30ASP
5 m (16.4 ft) shielded cable, M8 threaded connector	HMP50Z500SP
10 m (32.8 ft) shielded cable, M8 threaded connector	HMP50Z1000SP
Sampling cells (available only for ISO G1/2")	
Sampling cell	DMT242SC
Sampling cell with 1/4" male Swagelok connectors	DMT242SC2
Sampling cell with quick connector and leak screw	DSC74
Two-pressure sampling cell	DSC74B
Separate cooling/venting coil for sampling cells	DMCOIL

Dimensions in mm (inches)



0710-133

Figure 23 DMT152 Dimensions



www.vaisala.com

